

## CLAIMS

- 1 1. A method, operable in a system that monitors a network, for discovering devices  
2 of various device types, wherein, for each device type, discovery information  
3 specifying a directory lookup procedure and a network probe procedure has been  
4 provided for that device type, the method comprising:
  - 5 (a) providing a discovery framework that is controlled by the system to  
6 discover devices on the network, the discovery framework having a  
7 predetermined interface;
  - 8 (b) using the discovery information to create a plug-in module with the  
9 predetermined interface, the module specifying a directory lookup  
10 procedure for examining network directories for device references and a  
11 network probe procedure for probing the network for referenced devices;  
12 and
  - 13 (c) controlling the module with the discovery framework to discover devices of  
14 the specified type on the network.
- 1 2. The method of claim 1 wherein step (b) comprises:
  - 2 (b1) during a discovery operation, reading the discovery information for a  
3 specific device type; and
  - 4 (b2) using the discovery information to instantiate a plug-in module with a  
5 directory lookup procedure and a network probe procedure that are both  
6 dependent on the specific device type and with a predetermined interface  
7 that is independent of the specific device type.
- 1 3. The method of claim 1 wherein step (b) comprises:
  - 2 (b1) during a discovery operation, reading the discovery information for a  
3 specific device type; and

4 (b2) using the discovery information to instantiate a lookup discovery module  
5 and a probe discovery module for devices of the specific type.

1 4. The method of claim 1 wherein the predetermined interface comprises a lookup  
2 interface and a probe interface.

1 5. The method of claim 4 wherein step (c) comprises:

2 (c1) controlling the module via device type independent method calls in the  
3 lookup interface to find references to devices of the specific type in the  
4 network directories using device type dependent procedures; and

5 (c2) controlling the module via device type independent method calls in the  
6 probe interface to probe the network using device type dependent  
7 procedures to obtain network addresses of devices with references  
8 discovered in step (c1).

1 6. The method of claim 5 further comprising:

2 (e) specifying a range of network addresses; and

3 wherein step (c2) comprises probing each address in the range of addresses.

1 7. A method, operable in a system that monitors a network, for discovering devices  
2 of various device types, wherein, for each device type, discovery information  
3 specifying a directory lookup procedure and a network probe procedure has been  
4 provided for that device type, the method comprising:

5 (a) providing a discovery framework that is controlled by the system to  
6 discover devices on the network, the discovery framework having a  
7 predetermined interface;

8 (b) specifying a device type for devices to be discovered;

9 (c) using the discovery information for the specified device type to create a  
10 plug-in module with the predetermined interface, the module specifying a

11 device type dependent directory lookup procedure for examining network  
12 directories for device references and a device type dependent network  
13 probe procedure for probing the network for referenced devices; and  
14 (d) controlling the module with the discovery framework via device type  
15 independent method calls in the lookup interface to find references to  
16 devices of the specified type in network directories using device type  
17 dependent procedures in the module.

1 8. The method of claim 7 further comprising:  
2 (e) pinging each address in a specified address range when device  
3 references are found in step (d); and  
4 (f) when a response is received at an address from a ping, determining  
5 whether a device located at that address is SNMP compliant.

1 9. The method of claim 8 further comprising:  
2 (g) for each SNMP compliant item for which information is located in step (f),  
3 controlling the module via device type independent method calls in the  
4 probe interface to probe the address using device type dependent  
5 procedures to determine whether any devices at the address match the  
6 specified device type.

1 10. The method of claim 9 further comprising:  
2 (h) for each device matching the specified device type, using a device specific  
3 protocol to retrieve device information when the device is not an SNMP  
4 compliant device.

1 11. The method of claim 10 wherein the device specific protocol is contained within a  
2 description file referenced by the device type dependent probe procedures.

1 12. Apparatus, operable in a system that monitors a network, for discovering devices  
2 of various device types, wherein, for each device type, discovery information  
3 specifying a directory lookup procedure and a network probe procedure has been  
4 provided for that device type, the apparatus comprising:

5 a discovery framework that is controlled by the system to discover devices  
6 on the network, the discovery framework having a predetermined interface;

7 a module creation mechanism that is responsive to the discovery  
8 information to create a plug-in module with the predetermined interface, the  
9 module specifying a directory lookup procedure for examining network directories  
10 for device references and a network probe procedure for probing the network for  
11 referenced devices; and

12 a discovery procedure in the discovery framework that controls the module  
13 to discover devices of the specified type on the network.

1 13. The apparatus of claim 12 wherein the module creation mechanism comprises:

2 a reader that, during a discovery operation, reads the discovery  
3 information for a specific device type; and

4 an object instantiator that uses the discovery information to instantiate a  
5 plug-in module with a directory lookup procedure and a network probe procedure  
6 that are both dependent on the specific device type and with a predetermined  
7 interface that is independent of the specific device type.

1 14. The apparatus of claim 12 wherein the module creation mechanism comprises:

2 a reader that, during a discovery operation, reads the discovery  
3 information for a specific device type; and

4 an object instantiator that uses the discovery information to instantiate a  
5 lookup discovery module and a probe discovery module for devices of the  
6 specific type.

- 1 15. The apparatus of claim 12 wherein the predetermined interface comprises a  
2 lookup interface and a probe interface.
  
- 1 16. The apparatus of claim 15 wherein the discovery procedure comprises:
  - 2 a lookup mechanism that controls the module via device type independent method calls in the lookup interface to find references to devices of the specific type in the network directories using device type dependent procedures; and
  - 5 a probe mechanism that controls the module via device type independent method calls in the probe interface to probe the network using device type dependent procedures to obtain network addresses of devices with references discovered by the lookup mechanism.
  
- 1 17. The apparatus of claim 16 further comprising a user interface that receives  
2 information from a user specifying a range of network addresses and wherein the  
3 probe mechanism comprises a mechanism for probing each address in the range  
4 of addresses.
  
- 1 18. Apparatus, operable in a system that monitors a network, for discovering devices  
2 of various device types, wherein, for each device type, discovery information  
3 specifying a directory lookup procedure and a network probe procedure has been  
4 provided for that device type, the apparatus comprising:
  - 5 a discovery framework that is controlled by the system to discover devices on the network, the discovery framework having a predetermined interface;
  - 7 a user interface for specifying a device type for devices to be discovered;
  - 8 a module creation mechanism that uses the discovery information for the specified device type to create a plug-in module with the predetermined interface, the module specifying a device type dependent directory lookup procedure for examining network directories for device references and a device type dependent network probe procedure for probing the network for referenced devices; and

13                   a discovery procedure that controls the module with the discovery  
14                   framework via device type independent method calls in the lookup interface to  
15                   find references to devices of the specified type in network directories using  
16                   device type dependent procedures in the module.

1   19. The apparatus of claim 18 further comprising means for pinging each address in  
2                   a specified address range when device references are found by the discovery  
3                   procedure and means for determining whether a device located at an address is  
4                   SNMP compliant when a response is received at the address from a ping.,.

1   20. The apparatus of claim 19 further comprising a discovery procedure operable for  
2                   each SNMP compliant item for controlling the module via device type  
3                   independent method calls in the probe interface to probe the address using  
4                   device type dependent procedures to determine whether any devices at the  
5                   address match the specified device type.

1   21. The apparatus of claim 20 further comprising means operable for each non  
2                   SNMP compliant device for using a device specific protocol to retrieve device  
3                   information.

1   22. The method of claim 21 wherein the device specific protocol is contained within a  
2                   description file referenced by the device type dependent probe procedures.

1   23. Apparatus, operable in a system that monitors a network, for discovering devices  
2                   of various device types, wherein, for each device type, discovery information  
3                   specifying a directory lookup procedure and a network probe procedure has been  
4                   provided for that device type, the apparatus comprising:  
5                   means controlled by the system for discovering devices on the network,  
6                   the discovery means having a predetermined interface;

7                   means responsive to the discovery information for creating a plug-in  
8                   module with the predetermined interface, the module specifying a directory  
9                   lookup procedure for examining network directories for device references and a  
10                  network probe procedure for probing the network for referenced devices; and  
11                  means for controlling the module to discover devices of the specified type  
12                  on the network.

1   24. A computer program product, operable in a system that monitors a network, for  
2                  discovering devices of various device types, wherein, for each device type,  
3                  discovery information specifying a directory lookup procedure and a network  
4                  probe procedure has been provided for that device type, the computer program  
5                  product comprising a computer usable medium having computer readable  
6                  program code thereon, including:

7                   discovery framework program code that is controlled by the system to  
8                  discover devices on the network, the discovery framework having a  
9                  predetermined interface;

10                  program code for using the discovery information to create a plug-in  
11                  module with the predetermined interface, the module specifying a directory  
12                  lookup procedure for examining network directories for device references and a  
13                  network probe procedure for probing the network for referenced devices; and

14                  program code in the discovery framework for controlling the plug-in  
15                  module to discover devices of the specified type on the network.

1   25. The computer program product of claim 24 wherein the program code for  
2                  creating the plug-in module comprises program code operable during a discovery  
3                  operation for reading the discovery information for a specific device type and  
4                  program code that uses the discovery information to instantiate a plug-in module  
5                  with a directory lookup procedure and a network probe procedure that are both

6 dependent on the specific device type and with a predetermined interface that is  
7 independent of the specific device type.

1 26. The computer program product of claim 24 wherein the program code for  
2 creating the plug-in module comprises program code operable during a discovery  
3 operation for reading the discovery information for a specific device type and  
4 program code that uses the discovery information to instantiate a lookup  
5 discovery module and a probe discovery module for devices of the specific type.

1 27. A computer data signal embodied in a carrier wave, operable in a system that  
2 monitors a network, for discovering devices of various device types, wherein, for  
3 each device type, discovery information specifying a directory lookup procedure  
4 and a network probe procedure has been provided for that device type, the  
5 computer data signal comprising:

6 discovery framework program code that is controlled by the system to  
7 discover devices on the network, the discovery framework having a  
8 predetermined interface;

9 program code for using the discovery information to create a plug-in  
10 module with the predetermined interface, the module specifying a directory  
11 lookup procedure for examining network directories for device references and a  
12 network probe procedure for probing the network for referenced devices; and

13 program code in the discovery framework for controlling the plug-in  
14 module to discover devices of the specified type on the network.